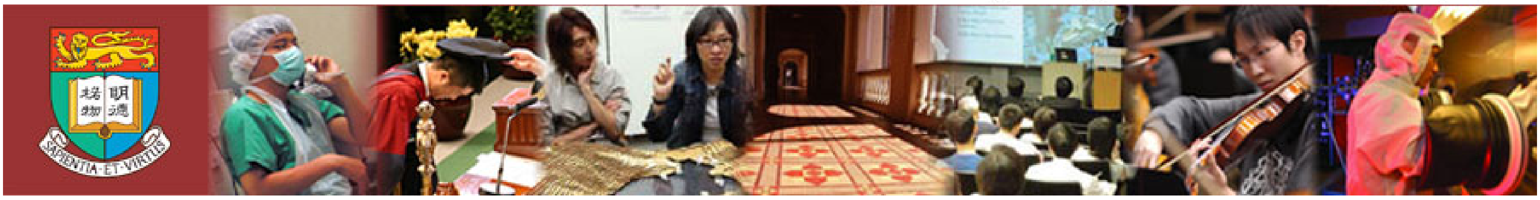

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Exploring How to Develop Customer-Oriented Business Strategies in a Clothing Supply Chain: a Study in Southern China

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Abstract — **Understanding customer expectations is one of the keys to success for today's clothing manufacturers. Previous studies have explained how operational performance can be improved by a better understanding of customer-perceived values. This paper presents an analysis of data collected through a questionnaire from 62 clothing manufacturers in the Pearl River Delta (PRD) of Southern China. The data collected was first classified into three groups using cluster analysis. The classification is based on how well the respondents recognize the expectations of their customers, including both industrial customers and consumers. The paper then empirically explores the characteristics of each group and how such characteristics are related to the internal operations performance; internal operations are grouped into two major types: planning processes and operational processes. The paper concludes by presenting a relationship model that can be used as a reference tool by those organizations operating in the PRD clothing industry to improve internal operations performance by enhancing customer satisfaction.**

Keywords — **cluster analysis, customer-perceived values, operational performance, the PRD clothing industry**

I. INTRODUCTION

Global competition has resulted in an increased demand for high product quality and at the same time increased pressure to reduce costs. Multinational companies commonly adopt global business strategies to reduce production costs and to enhance organizational competitiveness through relocating or outsourcing labor-intensive operations that only require basic industrial skills to low labor cost regions [1] like China, Sri Lanka and Vietnam.

Since the clothing industry is a labor-intensive industry, some companies outsource their operations to contractors with a good reputation for quality products. Many such contractors are based in Hong Kong, and they in turn outsource work to various factories in Southern China. However, Hong Kong is no longer a low labor cost region and in order to remain cost competitive, many Hong Kong manufacturers have shifted their production plants to the PRD, taking advantage of lower operating costs. Because of keen global competition, Hong Kong's clothing industry could not just rely on economies of scale to maintain its global market share [2], but had create barriers to entry by forcing newcomers to spend heavily on overcoming existing customer loyalties. This was done by redesigning their business strategies to be more customer-responsive [3], [4]. This, in turn, necessitates the development of a model for the various business units, a model that can integrate their customer expectations into their business strategy along the entire supply chain. Such model can help business units to narrow the gap between their customer expectations and their own operational performance [5].

The primary objective of this paper is to explore how the PRD clothing manufacturers are attempting to integrate customer expectations into the business strategies development of their various business units along the supply chain. This paper firstly describes how to conduct cluster analysis and presents the findings. After that, the discussion of findings is provided. Finally, this paper concludes by presenting a model and some recommendations.

II. METHODOLOGY

This study collected data from 62 clothing manufacturers in the PRD using a well-refined questionnaire [6]. Respondents were self-assessed on a 5-point Likert scale ("1" as the worst and "5" as the "best") regarding to their customer-perceived values knowledge (CPV) and the performance of four planning processes and three operational processes. The performance of these processes was evaluated with five measures: reliability, responsiveness, flexibility, cost controlling and resource managing. Then, the collected data were subjected to cluster analysis with a three-phase model, which recommended by references [7] and [8], as shown in Fig. 1.

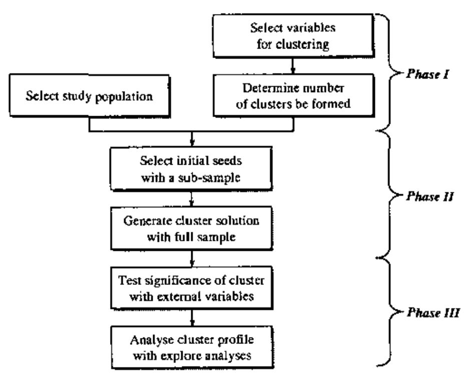

Fig. 1. Flowchart portrays the methodology.

Phase I clustered individuals into sub-groups based on their ratings on two CPV measures, namely industrial customer-perceived values knowledge (ICPV) and consumer-perceived values knowledge (DCPV), by depicting their ratings in a scatter plot (see Fig. 2). Fig. 2 indicates that individuals could be conceptually grouped into three sub-groups like Cluster A, B and C, based on their ratings on CPV. This suggests looking for a three-cluster solution. Thus, K-means clustering algorithm with parallel threshold approach was used to generate the best three-cluster solution.

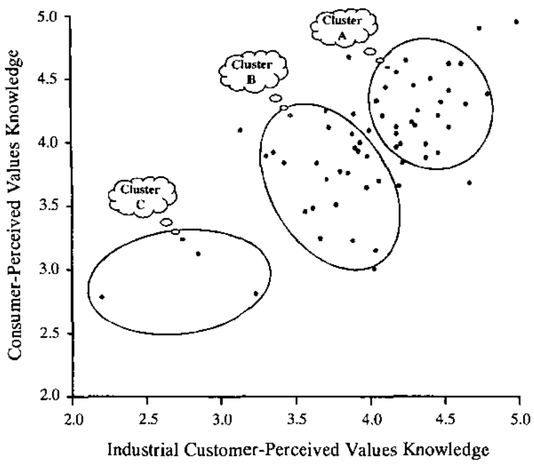

Fig. 2. Scatter plot for portraying all individuals' CPV measures.

Phase II has randomly taken a sub-sample (including 35 individuals) from the whole sample to determine three initial seeds for generating a three-cluster solution. The initial seeds were selected simultaneously. Individuals were assigned within the threshold distance to the nearest initial seed. The threshold distance between the i^{th} individual and the L^{th} cluster is expressed as [9]:

$$d(i, L) = \sqrt{\sum_{j=1}^{m}[x(i,j) - x_{avg}(L,j)]^2} \qquad (1)$$

where the mean of the j^{th} variable in the L^{th} cluster is denoted by $x_{avg}(L, j)$, while the number of individuals assigned to the L^{th} cluster is N(L). Threshold distances could be adjusted to include fewer or more individuals in the clusters while the process evolved [8]. After 5 iterations, three seeds were generated (see Table I).

TABLE I
SEEDS FOR THREE CLUSTERS

	Cluster A	Cluster B	Cluster C
ICPV	4.38	3.68	2.54
DCPV	4.32	3.73	3.00

All individuals were then subjected to clustering with maximum 10 iterations again. With the seeds, the distances between all individuals and the three-cluster seeds were calculated by using equation (1), and then the individuals were assigned to the nearest seed. After 4 iterations, the final cluster center of ICPV and DCPV were determined, representing the general characteristics of a cluster [7], [8]. The results are provided in the "Results" section.

Phase IV ensures representativiness of the cluster solution. One-way ANOVA was used for testing the significant difference in internal operations performance (IO) of various internal operations (including four planning processes and three operational processes), which were not used to generate the cluster solution, in order to validate the representative of the solution [7]. Findings are presented in the "Results" section too.

Finally, this paper explored the characteristics of each cluster, expecting that different clusters would result in different performance in their planning and operational processes by considering their performance measures: reliability, responsiveness, flexibility, cost controlling and resource managing. Accordingly, a model was developed to portray the relationships between customer-perceived values knowledge and internal operations performance among different clusters. A detail discussion is presented in the "Discussion" section.

In addition, this paper studied the impacts of a planning process on its corresponding operational process by calculating the Pearson correlation coefficient (r) between these two processes:

$$r = \frac{\sum(X-\bar{X})(Y-\bar{Y})}{\sqrt{\left[\sum(X-\bar{X})^2\right]\left[\sum(Y-\bar{Y})^2\right]}} \qquad (2)$$

where X = score of a participant on the X variable
$\bar{X}$ = mean of all scores on the X variable
Y = score of a participant on the X variable
$\bar{Y}$ = mean of all scores on the X variable

A positive sign indicates that the planning process has a constructive impact on its corresponding operational processes, and a negative sign indicates that there exists a destructive impact [10]. The findings are discussed in the "Results" section.

III. RESULTS

A. One-way ANOVA

The results of ANOVA for examining the significant difference in IO of seven internal operations among clusters are stated in Table II. Results show that the IO for all internal operations is significantly different ($p < 0.005$) among clusters, providing the evidence of external validity of the three-cluster solution.

TABLE II
ANOVA RESULTS FOR TESTING EXTERNAL VALIDITY

Internal Operation	ANOVA F	Sig.
Plan supply chain	23.197	0.0005
Plan sourcing	15.143	0.0005
Plan manufacturing	13.243	0.0005
Plan delivering	10.175	0.0005
Sourcing	10.182	0.0005
Manufacturing	8.435	0.001
Delivering	16.532	0.0005

B. Internal Operations Performance

This study has generated a three-cluster solution through cluster analysis, see Table III. Cluster A received the highest values in both industrial customer-perceived values knowledge (ICPV) and consumer-perceived values knowledge (DCPV), and Cluster C achieved the lowest values in both ICPV and DCPV. To clearly characterize each cluster, a label was given to each cluster based on respondents' CPV, thus, Cluster A, B and C named 'Sufficient CPV', 'Average CPV' and 'Insufficient CPV' respectively. Cluster C is the smallest group, consisting only three members. The size of Cluster A and B are near, including 29 and 30 companies respectively.

TABLE III
CLUSTER CENTERS FOR THREE CLUSTERS

		Cluster A	Cluster B	Cluster C
Label		Sufficient CPV	Average CPV	Insufficient CPV
No. of Company		29	30	3
Center	ICPV	4.37	3.79	2.79
	DCPV	4.35	3.81	2.95

Table IV describes the internal operations performance (IO) of different operations among clusters. Obviously, Cluster A was the best group, scoring at least 3.8 in all operations, especially better in the processes of "Plan Supply Chain", "Plan Sourcing" and 'Delivering". Cluster B achieved average performance in all processes (ranging from 3.37 to 3.63), but its performance was still better than Cluster C. Compare with Cluster A, Cluster B is relatively weak in developing business strategies (scoring 3.37).

Compare with other clusters, Cluster C recorded a relative lower score in all processes; all scores are less than 2.8. Furthermore, the performance of Cluster C was especially poor in the processes of "Plan Manufacturing", "Plan Delivering" and "Delivering", scoring 2.33, 2.40 and 2.40 respectively.

TABLE IV
INTERNAL OPERATIONS PERFORMANCE

Internal Operations	Cluster A	Cluster B	Cluster C
Plan supply chain	4.05	3.37	2.67
Plan sourcing	4.10	3.45	2.73
Plan manufacturing	3.89	3.56	2.33
Plan delivering	3.97	3.57	2.40
Sourcing	3.87	3.42	2.60
Manufacturing	3.90	3.47	2.60
Delivering	4.02	3.63	2.40

C. Impact of Planning Process

Table V shows the Pearson correlation coefficients between three planning processes and their corresponding operational processes for three clusters. Results are significant in Cluster A and B, but not in Cluster C. This may be explained by the small cluster size of Cluster C, involving only three members. Besides, Table V reflects a strong correlation between the planning and the operational processes ($r > 0.45$).

TABLE V
PEARSON CORRELATION COEFFICIENTS FOR THREE CLUSTERS

Internal Operations	Cluster A	Cluster B	Overall
No. of Company	29	30	59
Sourcing	0.692**	0.460*	0.672**
Manufacturing	0.883**	0.803**	0.863**
Delivering	0.829**	0.557**	0.756**

* At 0.05 significant level
** At 0.01 significant level

IV. DISCUSSION

As shown in Table IV, this paper finds that companies are able to develop better business strategies if they have sufficient CPV. These companies have adopted strategic sourcing policies. In addition, companies with sufficient CPV are better in their delivering functions. However, considering the sourcing function, Cluster A obtained a relatively larger gap (0.23) in-between the planning and the operational processes. This reflects that Cluster A can plan better in its sourcing (scored 4.10), but managed it ineffectively.

Compare with Cluster A, this study indicates that Cluster B has less ability in developing business strategies. Since business strategies development requires a company having long-term perspective. If a company have insufficient knowledge of what its customers need, this is difficult to construct customer-oriented strategies. These are supported by the performance differences (in processes of "Plan Supply Chain" and "Plan Sourcing") between Cluster A and B, resulting 0.68 and 0.65 respectively.

Considering the performance of Cluster C, this paper finds that companies perform their delivering functions (including both planning and operational processes) poorly while they are lack of CPV. This finding delivers an important message: "company can improve its delivering performance by enriching its CPV!" This is supported by the performance differences in "Plan Delivering" and "Delivering" between Cluster B and C, recording 1.17 and 1.23 respectively. Similarly, Cluster C recorded a better operational performance than the planning performance in its manufacturing process. This indicates that Cluster C spent less effort on planning its manufacturing process. For the long run, Cluster C cannot improve its performance of manufacturing operations without the support of a better planning. This explains why Cluster C produces a relative lower score for manufacturing process (see Table IV). In addition, this paper indicates that the effectiveness for planning manufacturing can be enhanced by CPV, because companies can schedule their production capacities efficiently while having better knowledge of customer expectation.

In order to further explore the influence of CPV on internal operations performance (IO), IO was firstly depicted into five measures: reliability, responsiveness, flexibility, cost controlling and resource managing, see Figure 3. This figure shows that the performance scores in reliability, responsiveness and flexibility were nearly in a straight line, but the performance scores in cost controlling and resource managing show declined trend. These indicate that three clusters have done badly in cost controlling and resource managing. Thus, respondents can improve their performance through enhancing their competency in cost controlling and resource managing.

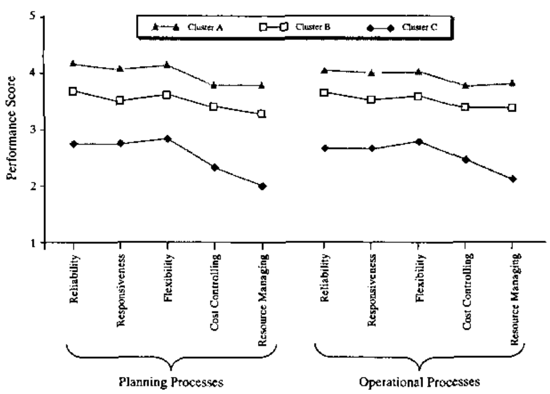

Fig. 3. Explore analysis of internal operations performance.

In addition, Figure 3 indicates a relative larger performance gap in the measures of cost controlling and resource managing between Cluster B and Cluster C, including both planning and operational processes. Compare with Cluster B, Cluster C cannot control its operating costs effectively and allocate its resources properly. This reflects the significant influence of CPV on cost controlling and resource managing. This further explains why Cluster C has performed relatively poor in both all planning and operational processes (refer to Table IV). If Cluster C cannot enhance its ability in cost controlling and resource managing, this will lessen its competitiveness in the long run. Finally, Cluster C will be eliminated through the keen competition.

Finally, this paper demonstrates that the constructive impacts of planning process on operational process (refer to Table V). In addition, this paper finds that the constructive planning effect on operational process becomes stronger when companies enrich their customer-perceived values knowledge (CPV). This is because companies with sufficient CPV can construct a better business strategic planning. Based on this business strategic planning, companies can develop their own operational planning, and then construct corresponding action plans. Thus, companies with sufficient CPV can perform better in their operational planning. With a good operational planning, companies can perform their operations effectively. These findings further support the constructive effect of CPV on improving internal operations performance.

V. Conclusion

Table VI summarizes the findings of this paper. With reference to the previous discussions, this paper has discovered two pairs of relationship; they are CVP with IO and planning process with operational processes. Accordingly, a relationship model was constructed that has plotted CPV against IO for three clusters regarding their planning and operational processes, see Figure 4. Figure 4 demonstrates that internal operations performance (IO) can be improved by obtaining more information from customers (CPV). Companies with sufficient knowledge in CPV can perform better in both planning and operational processes.

TABLE VI
SUMMARY OF THREE CLUSTERS

Cluster A	Cluster B	Cluster C
Achieve > 80% of total score in CPV	Achieve 60 – 80% of total score in CPV	Achieve < 60% of total score in CPV
Have sufficient customer-perceived values knowledge	Have average customer-perceived values knowledge	Have insufficient customer-perceived values knowledge
Perform better in all planning and operational processes	Perform average in all planning and operational processes	Perform poor in all planning and operational processes
Have sufficient ability in strategic planning	Have average ability in strategic planning	Have insufficient ability in strategic planning

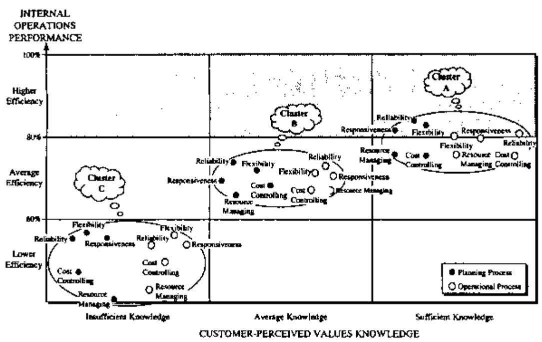

Fig. 4. Relationship model.

In addition, this paper has stated that if companies recognize which aspects their customers prefer, they can effectively allocate more resources to improve the performance in these aspects. For example, if a customer would like getting more assistance from the sales representative, companies can allocate more resources in providing training to their sales representatives in order to enhance the competency of sales representatives.

Finally, this paper recommends that the PRD clothing manufacturers to improve their internal operations perform by enriching their customer-perceived values knowledge (CPV). Companies should regularly conduct individual study to both their industrial customers and consumers. Table VI suggests some focal points for companies to conduct their customer studies.

TABLE VII
FOCAL POINTS FOR CUSTOMER STUDY

Industrial Customer	Consumer
☞ Product quality	☞ Product price
☞ Order handling	☞ Attitude in handling complaint
☞ Ability of their sales force	
☞ Interaction with operational staff	☞ How to enhance customer satisfaction and customer loyalty
☞ Social responsibility and accountability	☞ How to build up a corporate image
	☞ How to build up consumer's commitment

VI. Appendix

The definitions of terminologies used in this paper are stated in Table VIII.

TABLE VIII
DEFINITIONS

Terminology	Definition
Industrial customer-perceived values knowledge (ICPV)	Knowledge of what the industrial customers (company that purchases products for its commercial uses) expected to be obtained.
Consumer-perceived values knowledge (DCPV)	Knowledge of what consumers (persons who purchases products for his personal uses) expected to be obtained.
Plan supply chain	Planning projected appropriation of infrastructure in a supply chain environment.
Plan sourcing	Planning resources in sourcing to satisfy customers' expectation.
Plan manufacturing	Planning resources in production to meet the requirements of production.
Plan delivering	Planning resources in delivery in order to meet the requirements of delivery.
Sourcing	Operations are designed for purchasing raw materials, subassemblies, and products to meet the customer expectation.
Manufacturing	Operations are designed to add value to purchased parts through mixing, assembling, separating, forming, machining, and chemical processes to meet customer expectation.
Delivering	Operations are designed to deliver finished products to meet customer expectation.
Reliability	Ability in managing the process with regard to the accuracy in responding to customer expectation.
Responsiveness	Ability in managing the process with regard to the speed in responding to customer expectation.
Flexibility	Ability in managing the process with regard to the agility of the supply chain in responding to customer expectation.
Cost controlling	Ability in managing the costs associated with managing the process.
Resource Managing	Effectiveness in managing assets to support the process.

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